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PRODUCTION OF FLUORINE IN THE USSR

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One of the crude materials for the production of fluorine and fluorides (including synthetic cryolite) is fluorspar. The principal occurrences of fluorspar in the USSR are in the Transbaykal region, Central Asia, and on the island of Vaygach (60°E, 69°40' N). The Abagatuyev and the Kalanguyev deposits are being exploited in the Transbaykal region. The best known and most thoroughly prospected occurrences in Central Asia are at Aurakhmatsk (90 km from Tashkent) and Takobsk (50 km from Stalinabad) A recently discovered deposit which has a high calcium fluoride content is being exploited on Vaygach.(1)

Another important industrial source of fluorine are the waste gases of superphosphate plants, which contain silicon fluoride and hydrogen fluoride. The richest deposits of apatite in the USSR (stated to be the largest in the world) are located on the Kola Peninsula, in the vicinity of Kirovsk (Khibiny). Very large quantities of apatites are contained in these deposits: the thickness of the apatite ore layer reaches 180 m. The Khibiny apatite ore contains fluoroapatite and the following minerals: nepheline, titanomagnetite, sphene (titanite), and egirin (a vanadium ore).(2) On the basis of specially developed procedures, the Khibiny apatite-nepheline ores are being utilized for the production of phosphate fertilizers and a great number of other chemical products. "Some Developments in the Field of Soviet Chemistry and Chemical Technology" OO-W-17325, states that in 1944 more than 20 types of chemical enterprises in the USSR used apatite-nepheline ore and its by-products as a source of crude material. OO-W-17325 gives information published in January 1950. In 1939, the Institute of Fertilizers and Insectofungicides had developed two methods for a practically complete extraction of phosphorus, fluorine, and rare earths from apatite. One of these methods involved treatment of the apatite with nitric acid and the other with sulfuric acid A report on these methods was made by Prof S. I. Vol'fkovich at a meeting held at Kirovsk (Khibiny) 31 December 1939 - 4 January 1940 by the Academy of Sciences USSR, and several specialized institutes

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(Scientific Research Institute of Fertilizers and Insectofungicides, State Institute of Applied Chemistry, etc.) on the occasion of the 10th Anniversary of Kirovsk and of the local apatite industry. According to this report, these methods were scheduled for industrial application in the near future. The meeting recommended that the Third Five-Year Plan provide for the design and construction at Kirovsk and Monchegorsk of sulfuric acid plants based on the local ores pyrrhotine and nickel and copper sulfides, plants for the production of double superphosphate with fluorides and silica gel ("white soot") as by-products, plants for the production of rare earths of the cerium group, of titanium pigments, of phosphate slag, and of insecticides and fungicides containing copper. The desirability of setting up pilot-plant experiments and of organizing further projects in connection with the production of vanadium and titanium steels by utilizing products obtained by treating apatite-nepheline ores, egirin, and perovskite was also emphasized at the meeting.(3)

It is not known how far the work planned in 1939 - 1940 has advanced. However, it was reported in 1949 and 1950 that recent and rapid advances had taken place in connection with the Kola Peninsula apatite-nepheline development and its chemical ramifications.(2) As far as production of phosphate fertilizers is concerned, the 1946 - 1951 Five-Year Plan provides doubling of the output in 1950 with reference to the level of production in 1940. While the production of titanium pigments was only projected in 1939, titanium dioxide for titanium white was actually produced (according to Pozin) in 1949 from sphene concentrates containing up to 30% of TiO_2.

These factors should be considered in estimating the actual and potential USSR capacity for fluorine production, because fluorine, as stated above, is a by-product of apatite conversion.

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1. A. I. Belyayev, Metallurgiya Legkikh Metallov (Metallurgy of Light Metals), Metallurgizdat, Moscow, 1944, pp 183, 184,

25X1 2. M. Ye. Pozin, Tekhnologiya Mineral'nykh Soley (Technology of Inorganic Salts), Goskhimizdat, Moscow/Leningrad, 1949, pp 471-473 and 535-537,
25X1 FDD No 513963;

3. "10th Anniversary of Kirovsk and the Apatite Industry," Zhurnal Khim. Promyshlennosti, Vol XVII, No 6, June 1940, pp 60, 61

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